Chapter 7

CONTROLLING AQUATIC WEEDS

Section A—General Considerations

7-1. Aquatic Environments. Aquatic weeds vary greatly in their nature and in the type of aquatic environment in which they grow. Examples of different aquatic environments are: (1) banks above the waterline of canals and ponds; (2) shallow edges of canals, lakes, and ponds in which emersed plants grow rooted in bottom mud, extending their leaves and stems above the waters surface, (3) deeper areas of lakes and ponds, and (4) flowing water in canals and drainage ditches. The environment largely determines what weeds will be present and what methods will be most effective for their control.

7-2. Growth Habits of Aquatic Weeds. An aquatic weed may be a grass or grass-like plant (e.g., common reed, cattail, or sedge), a broadleaf (dicot), an emersed or floating plant with all or most of its foliage above the water, or a submersed plant growing entirely under the water surface. The submersed weeds vary from those rooted in bottom mud to the leafless, rootless algae. The microscopic algae give water a greenish color that varies in intensity from a barely discernible tinge to a pea-soup color and density. It may cause objectionable odors and tastes in drinking water. Filamentous algae produce threadlike or surface scums that interfere with fishing and obstruct underwater screens and sprinkler systems. Some algae grow on submerged rocks and on the bottoms and walls of concrete swimming pools, making them slippery and hazardous. The growth habit of an aquatic weed greatly influences the choice of control methods.

Section B—Construction Aids

7-3. Depth and Gradient. Deepening the edges of ponds, lakes, and reservoirs to 2 feet or more will prevent or reduce the growth of emersed weeds such as cattails, bulrushes, and water primrose. Deepening is also likely to narrow the border of submersed weeds so that they can be managed more easily. Providing a uniform gradient in the bottom of a canal or pond, eliminating high and low spots, permits thorough draining and marginally effective control of many submersed waterweeds (but not hydrilla) after 3 or 4 days of drying.

7-4. Bottom Liners. Lining ditches and canals with concrete or asphalt usually prevents or reduces the growth of rooted submersed weeds. Filamentous algae may grow on concrete linings and structures, however, and greatly reduce waterflow capacity. Also, silt deposits in lined canals can support obstructive growths of rooted submersed weeds in water as deep as 8 to 10 feet. A few species can grow at depths of 25 to 30 feet.

7-5. Shaping Banks and Reducing Obstructions. Shaping ditch-banks to provide uniform crowns and slopes, and maintaining roadways on one or both banks, are essential for efficient chaining, dragging, mowing, or spraying operations to control aquatic weeds. Careful designing and spacing of checks, weirs, turnouts, bridges, and other structures along canals minimizes interference with equipment used for mechanical or chemical control of aquatic weeds. Similar consideration can be given to the construction of pond and lake shorelines. Removing stumps, logs, and other obstructions from ponds, lake margins, and access channels facilitates using underwater mowers and weed harvesters.

Section C—Management Practices

7-6. Draining and Drying. To control cattails in ponds and marshy areas, remove the water, plow the ground, and let the area dry for a few weeks. Then maintain a water depth of 3 feet or more for several months, if possible. To control submersed weeds in canals with uniform flow gradients, drain the canals and allow them to dry for 3 to 5 days. Repeat this as necessary, when drainage or irrigation water is not needed.

7-7. Fertilizing and Shading:

a. In the southern states, mineral fertilizers are frequently applied in ponds to stimulate the growth of planktonic algae that shades the pond bottom and prevents or reduces the growth of rooted submersed weeds. This is a very useful practice in ponds that are used as fisheries. Fertilizing does not control submersed weeds, however, where the outflow or change of water

in a month exceeds the water storage capacity of the canal or pond. Nor will fertilizing control weeds in cooler waters of the central and northern states.

b. To control rooted submersed weeds and waterlilies in ponds with stable water levels, apply 100 to 200 lb/a of nitrogen, phosphorous, and potassium fertilizer with an analysis of 8-8-2 beginning in late winter or early spring. Apply every 2 weeks until a white disc or plate placed 12-14 inches below the water surface is invisible. Then apply fertilizer as necessary to maintain the density of the algae. Do not overfertilize. An excessive algal growth is unattractive, can cause oxygen depletion and kill fish, and may clog pump inlet screens with filamentous algae. Growth of filamentous algae is a sign of overfertilizing.

c. Physical shading-out of submersed weeds can be achieved with floating styrofoam planks or balls, or plastic sheeting. It can also be achieved by using dyes such as nigrosine or eosine black.

Section D—Mechanical Removal

7-8. Hand Pulling. Although the traditional hand and mechanical methods of controlling aquatic weeds have been replaced to a large extent by herbicides, the hand and mechanical methods are still advantageous in many situations. Young plants of cattail, buttonbush, willow, and certain other emersed or marsh species can be eliminated by hand pulling. Frequent inspection of the channel, pond, or marsh, and pulling when plants are young and few in number, however, are necessary for effective and economical control.

7-9. Mowing and Draglining:

a. Self-propelled and float-mounted sickle-bar mowers, and harvesters that cut off submersed weeds below the water surface at depths of 6 inches to 6 feet, are available. They are restricted to operating in open water areas that are unobstructed by stumps and trees, and they are often limited by difficulty of access and the topography of the shoreline.

(1) To eliminate cattails, cut the stems off below the water surface during the early heading stage and again 1 to 2 months later when all regrowth is emersed. A third cutting is necessary if regrowth occurs a second time.

(2) Small patches of weeds such as waterlilies and watershield can be eliminated by cutting the leaves off below the water surface at frequent intervals. Five or six cuttings a year may be necessary.

(3) For temporary control of submersed waterweeds in large canals and rivers, around boat docks, and in fishing and swimming areas of ponds and lakes, mow as deeply as possible and remove dislodged weeds. In canals, the dislodged weeds should be trapped downstream and removed by draglining or other means to prevent them from lodging against structures, clogging the canal, and causing overflows, canal breaks, or washed-out structures. In ponds and lakes, weed debris that accumulates along the shoreline can be removed by draglining, cabling, conveying, harvester-type devices, or other mechanical means. Removing and disposing of mowed and harvested weeds is both difficult and costly.

(4) One or two harvests per year may be sufficient in the northern states, but two to four may be required in southern areas because of the longer growing season.

(5) A small harvester consisting of a cutter head and a conveyor belt to deposit cut weeds on a deck may cost less than $10,000, but sophisticated equipment costs more. It may be most cost-effective to accomplish this work by contracting with an aquatic-harvester company.

b. In canals with flows of water greater than 70 cubic feet per second, control of submersed weeds by mechanical methods often is less costly than chemical methods. In canals that supply water for sprinkler irrigation, however, mechanical methods are undesirable because fragments of dislodged weeds often clog sprinkler heads, valves, screens, and other irrigation equipment. Also, spread of infestations downstream may result.

c For removal of submersed waterweeds from irrigation and drainage canals, pull a heavy chain, drag, or disk upstream along the bottom of the canal with a tractor on each bank. Several trips are usually necessary to dislodge all weed growth. Trap the floating masses of weeds at strategic places downstream, and remove them mechanically or by hand.

Section E—Biological Control

7-10. Herbivorous Fish:

a. Several species of fish, notably the Chinese grass carp (white amur) and several species of *Tilapia*, are presently used to control algae and rooted aquatic weeds. *Tilapia* are tropical and

are suitable only for certain warm waters in southern states. Adult *Tilapia* can survive and reproduce in fresh or brackish water that does not fall below 50° F.

b. The Chinese grass carp is adapted to a wide range of climatic conditions, and it has performed very well as a biological control for aquatic weeds. Few states now permit the introduction of the Chinese grass carp (and then only the sterile triploid form) because of uncertainty regarding its possible detrimental effects on native fish and the aquatic environment. In some of the southern states the Israeli carp is stocked to control filamentous algae.

c. Grass carp are normally stocked at a rate of 10 to 20 fish per acre. They eat submerged plants, but, if there is an inadequate supply of their preferred food, they will even feed on lily, cattail, and other emergent species. Do not stock them where aquatic plants are desired, and use a conservative stocking rate regardless of the severity of the weed problem.

d. These fish could be harmful in wetland areas and waterfowl habitat. Be sure to comply with state and federal regulations.

7-11. Other Biological Control Agents. The *Agasicles* beetle and stemborer, introduced to the United States from South America, are currently providing excellent control of Alligatorweed throughout much of this weed's range. Other biological control agents, such as plant pathogens and competitive vegetation, are under study.

Section F—Using Herbicides

7-12. Recommended Herbicides:

a. Herbicides often give more effective, longer lasting, and less expensive control of aquatic weeds than do mechanical or hand methods. In some ways, however, using herbicides to control aquatic weeds is more difficult and perhaps more hazardous than their terrestrial use. Copper sulfate was first used to control algae in 1904, and sodium arsenite was used to control waterhyacinth in 1902 and submersed weeds in 1927. However, most of the herbicides now registered by the Environmental Protection Agency for use in controlling one or more aquatic weeds were discovered since 1945.

b. Attachments 26 through 29 show herbicides that are recommended for use in ponds, lakes, and reservoirs; in drains and irrigation canals; on ditch-banks; and in reservoirs and canals carrying drinking water. Rates and times of application are given in general terms because local climates, water temperatures, site conditions, and water uses affect the performance and persistence of the herbicides and the procedures required for their safe and effective use.

c. Specific guidance should be obtained from state or federal aquatic weed specialists who are familiar with these local conditions. The county extension agent and the state fish and wildlife department are excellent sources of information.

d. Special precautions must be observed if the water is to be subsequently treated and used for human consumption. Normally, the chemical of choice in or near potable water is copper sulfate, fosamine, or AMS. Other compounds should be used only with prior approval of a MAJCOM or EFD pest management consultant.

7-13. Safety Considerations:

a. A few aquatic herbicides, such as acrolein, are poisonous to humans and other warm-blooded animals, and must be handled and used with caution and according to special procedures. Some herbicides are toxic to fish, but most do not injure fish at the concentrations required for weed control. Some injure fish food organisms, and a few may injure crops at low concentrations if they are used carefully.

b. Only limited information is available on the persistence and fate of herbicides in water, in aquatic soil, in fish, and in aquatic plants. Judgments on herbicide residues are subject to continual change on the basis of new information on the persistence of residues, toxicity to fish, etc. Labels on herbicide packages are kept up-to-date on such changes. Therefore, in addition to following all the precautions in chapter 1 for safely using herbicides, the user of an aquatic herbicide must determine that the treatment is necessary, and must carefully follow all instructions and restrictions on the label regarding aquatic situations in which the herbicide should and should not be used. The user must know how much time should elapse after herbicide treatment before treated water is used for drinking, fishing, swimming, or irrigating crops.

c. Local water quality regulations also must be considered. Herbicides should not be used in or near marshes and other wetland habitats unless their use has been clearly determined to be necessary.